# Gen Y, not so Bleeding Edge: The use of information technology in university teaching.

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**Abstract**: This paper investigates the adoption of bleeding edge technology by GenY university students. This technology was in a form of interactive feedback using mobile 'phones called 'ClickOn'. The factors considered in regards to technology adoption are trialability, observability, complexity and compatibility. Additional issues more specifically related to student engagement and attendance were also investigated. It was found that students in this cohort were reticent to adopt the technology in their learning environment. This is in contradiction to the current literature and society's general expectation. These findings may alert educators to possible unexpected barriers when utilising new technologies to improve student academic outcomes and as such will be of interest to university educators.

## Introduction

The general trend in education is to actively engage learners especially through the use of enjoyable learning tools such as that described in this paper. Tertiary education is often crowded up against students' paid work, leisure and family responsibilities (Montealegre & Applegate, 1994) and so it was felt that effective learning tools would enhance the experience of attending class through engaging the interest of the learner, thereby encouraging further attendance. Academic teaching staff at an Australian university sought to engage students through the adoption of ClickOn, an interactive learning tool. ClickOn is a proprietary software which draws upon pre-selected multiple choice questions for students to view.

The ClickOn software uses an internet connection to upload students' responses to these multiple choice test questions and return, in seconds, their collated responses to be viewed via web link by students and academic on a standard lecture theatre web linked screen. Students were required to register using their mobile 'phone carrier to enable access to the system. For those that were not able or willing to utilise the mobile 'phone technology, students used pen and paper to record their responses.

The interactive information technology 'ClickOn' was provided and supported by Wiley Publishing, which included a brief introductory session given in auditoriums for students on how to use the system. Wiley Publishing House's internet server was used to receive, collate and return students' responses via satellite link back to the auditorium's open web page (Figure 1. ClickOn Interactive Technology).

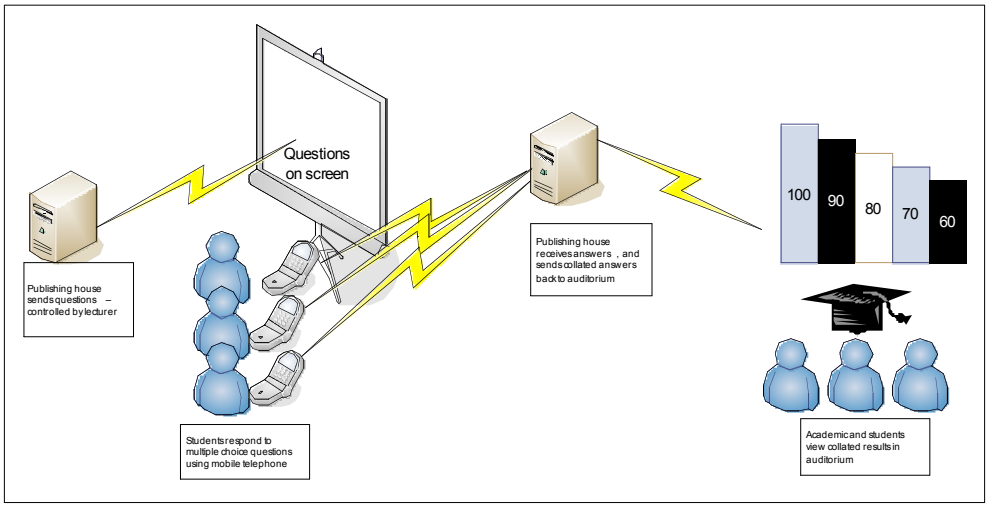



Figure 1. ClickOn Interactive Technology

The use of ClickOn was also intended to solve two other administration issues which had recently arisen and were problematic in nature. These issues included how the university where this study was undertaken could identify students classified as 'at risk' of non-completion of their course and assist them to improve their academic performance. One of the underlying assumptions made was that attendance (as a prerequisite of participation) is an important factor in students' final grades, their conceptual understanding of the curriculum and their ability to administer their subject effectively. These issues are discussed in detail in the literature review. Although attendance was not the only consideration in establishing a student's 'at risk' status it was felt that as students would be participating in a recorded exchange it would be easy to measure their attendance and use this as one part of observing their progress. It was also felt that the use of a modern and engaging teaching tool may have reduced the natural attrition rate through engaging a keener interest from students in the curriculum. This technology was introduced as part of the text and service offering provided by Wiley publishing who were prepared to support the technology and provide additional assistance if required, in its use. The use of this particular technology was decided upon because its use (via mobile 'phones) was believed to be aligned to students extant behaviour (i.e. their familiar and high use of mobile 'phones). It was also felt that the technology would provide a more active learning mode and because of this opportunity to actively participate (at least for a portion of lecture time) they would be more likely to continue attending.

The second problem to be resolved was that of internally promoting the subject in which ClickOn technology was being used. With the advent of the full adoption of WebCT as the common technological platform between subject co-ordinators and students it became impossible for student to surf across the various subject web sites to gauge the suitability of various future subjects and their corresponding assessment regimes. Under WebCT students can only access those subjects in which they are

enrolled. Hence, the old method of surfing and gathering information on future prospective subjects was denied to them. Consequently it was felt that a modernisation of the school's flagship subject by using ClickOn technology would enhance the marketability of the subject and draw greater enrolment numbers through word of mouth marketing.

**Profile of Student Cohort**

It was understood that the majority of students in this study were highly likely to fall into the Generation Y bracket of those born between 1977-1997 (Heebner, 2001). Consequently it was felt that this cohort were likely to respond quite favourably to the opportunity to use leading edge internet and digital technology especially given their predilection for blogging, integrated learning, use of wikis, podcasting (Pluss, 2007), online voting and audience polling.

Given that most students who were enrolled in the subject being to the Gen Y cohort of those born between 1977-1997 (Heebner, 2001) it is relevant to review the impact this has on technology adoption. It is a widely held belief that Gen Y has a strong technology preference. Shiu & Lenhart (2004) in their analysis of 54 million Americans who use instant messaging confirmed this belief, with 62% of Gen Y internet users regularly sending instant messages, compared with 37% of Gen X internet users. Gen Y also added photos, music and sought other means to use technology, more than any other generational group.

Faust, Ginno, Laherty and Manuel (2001) reported a 29% test score increase when new teaching methods which incorporated kinesthetic methods of teaching Gen Y students. Also, when assignment instructions were provided in a visual format there was a 10% reduction in refusal to do the assignment by the Gen Y students. From this literature, it would appear that Gen Y students do prefer to interact with technology in a learning situation (Prensky, 2001). This view is tempered by Brown (2007) who suggests that although students have a preference for technology their competence is limited. However it is believed that given their predilection for new technologies there was no anticipation of difficulties in regard to the adoption of the technology.

**Method**

A series of short multiple choice questions were given to students enrolled in a large introductory subject in a business degree throughout a twelve week semester. These questions served a multiple purpose: to ascertain attendance and to provide students and academic with instant feedback on students' comprehension of the lecture material just covered in that class. The question sheet also made provision to ask students about problems they may have had adopting the ClickOn technology. From a week to week basis when the ClickOn system was utilised the range in number of respondents was from 20 to 333. ClickOn was used weeks 1-6 inclusive and weeks 8-10 inclusive in a 12 week semester. The students were not required to use the system, their result did not contribute to any internal assessment and they were able to communicate freely with each other about possible answers to the quiz questions although they were not encouraged to do so. Each of these aspects were considered carefully prior to the adoption of the ClickOn system and it was deemed that it was of senior importance to create a friendly and supportive environment as suggested by

Oakes and Lipton (2003) than to adhere to strict draconian measures to attain maximum completions. This may have led to some students, although in attendance, not wishing to participate and some participating but conferring with colleagues about correct answers. Anecdotal information from academics indicates that the attendance numbers recorded from the tests were not unrealistic and that the peaks and troughs of attendance were indicative of that throughout the semester in this and other large subjects.

It was also important to consider issues such as equity across the student population. Some students, it was realised, would believe that the dollar cost (estimated to be at the very outside $5 per lecture but more likely, depending on the carrier, to be more like $0.20 per lecture) was prohibitive. Given this difficulty and anticipating that some students may not have a mobile 'phone, some may not have access to the web via their mobile 'phone and that some may simply not want to engage using this type of technology, paper based answer sheets were pre-printed and were available. So, use of the system was not mandatory because of the dollar cost, technical requirements and students' free will to choose.

In the final weeks of the semester students were asked to complete a written questionnaire to ascertain their degree of interest and use of the ClickOn technology. The questionnaire consisted of 65 questions with most questions in the form of a five point Likert Scale with strongly agree at one end of the scale to strongly disagree at the other. All items had a scale reliability (Cronbach's Alpha) co-efficients of over 0.70. Given that coefficients above 0.70 are considered acceptable (Furnham, Steele, & Pendleton, 1993), the items used are sound. A total of 90 students completed the survey.

Using an action research framework a smaller group of students (75) participated in qualitative information collection. The research was aimed at observing and responding to observed trends over the research period of weeks 1 to 5. This period covered students' responses from initial reaction, introduction, and actual experience to evaluation of the process. Students' comments were collected and analysed using content analysis.

## Literature Review

### Technology Adoption

The adoption of technology by various cohorts in society has been the subject of extensive research and analysis amongst the literature. For business people and customers (G. Moore, 1995), households (Forrester, 2005), nationalities and generations, the analysis is based on the original theory of Diffusion of Innovation by Rogers (1962). Its application to education has been especially observed, for example for nurse education and application (Lee, 2004), distance education (Ozdemir & Abrevava, 2007) and in the general education setting (Carr Jr., 2006) and is a significant source for this present paper.

Briefly, the Diffusion of Innovation/ rate of adoption theory highlights the stages of adoption: innovator, early adopter, early majority, late majority and laggards (Rogers, 1962). Rogers refined his theory (1995) to provide 5 expanded determinants of rates of adoption: Innovation Decision Process Theory, Individual Innovativeness Theory,

Rate of Adoption Theory, and Perceived Attributes Theory. These attributes can determine the extent and speed of adoption: **trialability** that it can be tried out**, observability** that results can be observed**, relative advantage** that it has an advantage over other innovations or the present circumstance**, complexity** that it is not overly complex to learn or use**,** and **compatibility** that it fits in or is compatible with the circumstances into which it will be adopted (Carr Jr., 2006).

Considerable research has been conducted on these attributes, and how significant they are, or the role they play in affecting rates of adoption of innovation, especially in relation to technology adoption. Some specific examples follow:

***Trialability***
Thompson, Higgins, and Howell (1991) discussed the Facilitating Conditions construct – that is that particular conditions assist in the adoption of the technology. These conditions include such elements as accessibility of information about the technology, and a champion to guide the adoption process.

***Observability***
Lee (2004) noted that nurses achieved faster rates of technology adoption when observing other 'experts' use the technically complex equipment. Current use was modeled for them making acquisition of the required new skills less daunting. Thus, with reference to Rogers' original Diffusion of Innovation theory work (1962), the greater the level of observability, the quicker early adopters and early majority will follow innovators in trial and regular use of a new technology.

***Relative Advantage***
Demonstrable advantage for adopting a new technology is required for something to have a relative advantage attribute. It is useful to recognise the Relative Advantage construct (Moore & Benbasat, 1991). A perceived usefulness of the change is relevant here. Davis (1989), replicated by Adams, Nelson and Todd (1992) focused specifically on information technology and its adoption based on perceived ease of usage and perceived usefulness, both aspects of relative advantage. That is, if the subject (in the case of this paper, a student) perceives that adoption of the change will provide an advantage over the current circumstances, then he/she is far more likely to be willing to make that change. Davis, in conjunction with Bagozzi and Warshaw (1989) did further research specifically on the Perceived Usefulness Construct, which also informs this paper.

***Complexity***
Complexity, the degree to which a change is difficult or has a number of components influences rate of adoption according to the literature. The Perceived Ease of Use Construct is discussed and tested by a range of researchers (Adams, Nelson, & Todd, 1992; Davis, Bagozzi, & Warshaw, 1989). Annis and Davis (1998), analysed recall and recognition of students with specific reference to the ease of use of the models and information presented to them by educators.

Thompson, Higgins, and Howell (1991) focusing on the utility of personal computers found that the level of complexity of the computers was a significant factor in determining adoption rate. The research informs this paper as there was a degree of

complexity involved for students in this case which did impact their rate of usage of the technology.

***Compatibility***

Compatibility is the degree to which a change is consistent with the circumstances in which it will be used. Bunker, Kautz and Nguyen (2007) found that compatibility of values in an organisation impacted the rate of adoption of the specified technology. That is, as the change was consistent with the organisational goals, practices and culture, it was adopted. This informs this paper as the organisation in question, a university, is inherently an environment of change and learning.

**Students' attitudes to the technology adoption**

Another very important area in the literature is the role attitude to the technology adoption plays. Significant work has been done on the impact attitude has toward behaviour – that is, using the system and liking using it (Davis, Bagozzi, & Warshaw, 1989; Fishbein & Ajzen, 1975; Taylor & Todd, 1995a, , 1995b). Where subjects find using technology enjoyable, it provides intrinsic motivation, according to research by Venkatesh, Morris, Davis and Davis (1992).

Thompson, Higgins, and Howell (1991) found that impressive results are achieved where the technology adoption actually makes learning more interesting; this is consistent with relative advantage (E. M. Rogers, 1995) discussion in the literature above. Compeau and Higgins (1999) and (1995) went further and found that the degree to which subjects anticipate using the technology, or when using it experience negative affect (boredom/frustration) will directly impact upon their subsequent adoption of the new technology.

Planned behaviour (Icek Ajzen, 1991; I. Ajzen, 2002) also assists in our understanding. Building on previous work (Fishbein & Ajzen, 1975) of reasoned action, Ajzen postulated that the stronger the intention to act, the more likely a subject will act. Thus, if a student plans to participate, they are more likely to participate. Given that students did not participate in Click On, this planned behaviour aspect should be analysed closely, and will be discussed below.

Venkatesh, Morris, Davis and Davis (2003) tested eight individual models of user acceptance, particularly in relation to information technology adoption rates. They then developed The Unified Theory of Acceptance and Use of Technology (UTAUT) and retested the original data on user intentions and found a significantly greater correlation, useful for predicting likely uptake of information technology. Thus, Rogers (1995) attributes in combination with student attitudes towards the use of the technology appear to combine to be a greater indicator of uptake of information technology.

**Student participation and attendance**

It is well recognised within education studies literature that increased attendance leads to improved performance for students (Gump, 2005). The importance of early attendance was a significant contributing factor to the university involved in this case study introducing its early assessment requirement of 'at risk' students; it was also one of the determining catalysts for introduction of the ClickOn technology. It was felt that students would be adversely affected not only in a direct academic way (the

direct correlation that if one does not attend one cannot adequately learn) (Jacobson, 2005), but also indirectly. Communications delivered in lectures about administration of the subject (such as instruction on how to use plagiarism checking software) and reminders about assessment due dates are not received by an absent student even with the use of electronic interfaces (which may be part of the reason that students refrain from attending (Edwards & Usher, 2001)). It was felt that the use of ClickOn would benefit the academic by the elimination of onerous tallying of attendance lists and benefit the student by making classes more interesting and enjoyable (Grimm, Soares, Agrawal, & Law, 2007) and assisting them with their learning.

Attendance also supports engagement with the curriculum, as students have greater exposure to the material, consequently are more likely to gain a conceptual understanding of it. Social factors are relevant here (Thompson, Higgins, & Howell, 1991). Students are more likely to attend classes if their associates do too; likewise, they are more likely to participate if their associates do too. Thompson, Higgins and Howell (1991) found just this in their research with utilisation and adoption of personal computers. The subjective norm construct is also discussed extensively in the literature (Icek Ajzen, 1991; I. Ajzen, 2002; Davis, Bagozzi, & Warshaw, 1989; Fishbein & Ajzen, 1975; Mathieson, 1991; Taylor & Todd, 1995a, , 1995b). Stated simply, students are influenced by others' perceptions and behaviours.

Social or normative factors are also inherently tied closely with an image construct (G. C. Moore & Benbasat, 1991). As noted in many motivational theories (Kanfur, 1990) associative behaviour is linked to self image as a determinant of motivation to act in a certain way. Moore and Benbasat (1989) found in their research on developing a measurement framework for perceptions of willingness to adopt information technology that the subjects express willingness to act consistent with their image of self and associates. Thus, if it is consistent to attend and participate in class with a student's image, then the student is more likely to engage in that way.

A novel approach to student attendance came from Neill (1961). His school 'Summerhill' established over various periods in Germany, Austria and lastly in the UK, espoused the ideal of freedom in learning and although not specially designed for school-averse children, found a greater preponderance of problem children attending. He found: "The average period of recovery from lessons aversion is three months"(Neill, 1961, p. 21). Neill observed that providing interesting material and non-mandatory attendance was successful in engendering improved attendance rates amongst the recalcitrant cohort.

**Attendance / Absenteeism**

According to Devadoss and Flotz (1996) student absenteeism is a problem of some magnitude across the global university sector. Many educators, in an effort to combat student absenteeism, are turning to more innovative teaching methods in an effort to engage students' interest in the subject being presented. These efforts are based on the generally held belief that attendance is a predictor of student performance as measured by final grades. Indeed, Romer (1993) stated that there is a difference of a whole grade ranking between a student who attends class and a student who does not. This is supported by Devadoss and Flotz (1996) whose findings also controlled for students' prior attainment and Durden and Ellis (1995) conclude that there is a

positive correlation between attendance and grades. This finding is further supported by Ellis, Durden and Gaynor's later work (Ellis, Durden, & Gaynor, 1998).

Of further interest is Romer's (1993) assertion that absenteeism is lower for subjects with a high mathematical component and Kvam's (2000) prediction that active learning methods assist students in the middle to low performance bands. The factors to which attendance is linked; successful final grades, low mathematical content of subjects and the use of active learning methods are all relevant in the context of this study. Given the generally lower socio-economic profile of students at this institution it is expected that students' overall final grades are likely to be lower that those of students from higher socio-economic backgrounds. Improving attendance and hence final grades may therefore be a significant factor in creating a level playing field for these students. The subject in which this study is held is reported as containing 'none to a little' mathematical content. This would predictively suggest that attendance will suffer. Following Kvam's (2000) suggestion that active learning methods reduce absenteeism the ClickOn technology was introduced.

These three factors are often a concern across many courses offered at university level which makes this study particularly relevant for those administrators and academics seeking to improve student outcomes through improving student attendance.

**Discussion and Analysis**

**Technology Adoption**

At week 2 of the semester, 82 students had endeavoured to adopt the technology by completing all the registration protocols up to connection and use in class. Unfortunately this number lost ground rapidly with students registered but then not able to receive the signal in the auditorium or were unable to use the system because of a variety of other problems.

Almost all students have a mobile 'phone (98% in sampled cohort for weeks 1-3). Many did not have internet-enabled mobile 'phones however, due to the cost constraint or simply having older model technology without this feature, the numbers are shown Table 1 – internet connection and registration. A profile of the students in this study was obtained from internal records stating the statistical local area (a geographic designation used by the Australian Bureau of Statistics – Fed. Gov.) provided by the institution in which the study was held. From this data it was established that the majority of the students' family homes were located in areas in which the median weekly individual income for persons aged 15 years and over who were usual residents was less than (and in some instances far less than) that of the Australian average ($466).

This may help to explain the reasons why many students did not own mobile 'phones that were able to connect to the internet and why those that may have had this feature choose not to participate, perhaps due to cost constraints. Comments from students surveyed using a qualitative approach mentioned that they could not use the technology because of telephone carrier issues and from having a pre-paid card rather than a contract. Comments included: 'You have to have credit to surf the net', and 'It costs too much to surf the net using a mobile'.

The varying numbers of students without an internet connection in table 1 reflects the changing profile of students attending classes. The make up of students in lecture one may partially match those attending in week 2, and partially match those attending in the following weeks. Anecdotal information from academics indicates that there appears to be a 'core' of students who attend the majority of the time and an 'outer core' which is far more volatile in nature and may change markedly from week to week, such that those attending in week 3 may bear very little resemblance to those attending the following class.

Table 1
*No internet connection*

| Week | No. of students with no internet connection | % students with no internet connection | Total number of students in attendance or participated |
|---|---|---|---|
| 1 | 110 | 33 | 333 |
| 2 | 145 | 49.3 | 294 |
| 3 | 109 | 50.7 | 215 |
| 4 | 48 | 50.5 | 95 |

In order to participate online, students also had to pre-register before the first lecture. This is often the first time when students gain any information about the course or its administration. Also, as the course is a first year subject, this was also the first lecture many students had ever attended at this or any university. All these factors rendered the trialability and accessibility of the Click On technology problematic. Table 2 shows the number of students who were unaware of the registration process through weeks 1-4.

Table 2
Registration, 'Did not know to register'

| Week | No. students unaware of registration | % students unaware of registration | Total number of students in attendance or participated |
|---|---|---|---|
| 1 | 132 | 39.6 | 333 |
| 2 | 21 | 7.1 | 294 |
| 3 | 3 | 1.4 | 215 |
| 4 | 3 | 3.2 | 95 |

Additionally a small number of students faced the issues of not having their mobile telephone with them that day, some could not register to use the technology when they tried to do so, some were out of credit on their 'phones, and some were waiting on activation emails from the publishing house, having only registered that morning.

**Student Profile**

In addition to the original usage of the ClickOn system a questionnaire was administered in the latter part of the semester (90 respondents). The students were equally matched on gender with exactly 45 females and 45 males in the survey. There were however, markedly more students in the age bracket 17-24 (84%) (Gen Y), than in the age bracket '25 and over' (14 respondents - 16%). Respondents in the self-reported category of 'level of experience as a computer user' showed the majority of respondents classifying themselves as experienced (56%), followed by a bit experienced at 29%.

***Trialability***
Due to the technical (and economic) constraints on use of Click on, on students' mobile 'phones, the vast majority opted not to use the facility, instead relying on the traditional paper-based testing method. However, respondents indicated fairly evenly regarding their availability of resources to use the system (35.6% agree or strongly agreed that they did not have the resources to use the mobile 'phone system and 35.6% disagreed or strongly disagreed that they did not have the resources). One respondent commented that 'I couldn't complete the registration (didn't get confirming email)' while another explained that 'The explanations of how it works and how to do it was too quick, I didn't get it'.

Whilst facilitating conditions were available – extensive guidance was provided for students to know how to use the system (Thompson, Higgins, & Howell, 1991), it was apparently not sufficient to enable significant uptake. Indeed, based on the trialability concept (E.M. Rogers, 1995) more students should have participated over the weeks. As the initial technical problems were corrected, accessibility, hence trialability improved. The opposite was observed, however, with less participation in ClickOn over the weeks. This would suggest that other factors of Rogers' five attributes were more important. In support of this view only 20% of respondents indicated that their mobiles were not compatible with the system. One student suggested that 'I would do it if it counted towards the subject assessment' and another felt that, 'If it was compulsory, more would have participated.'

In order to determine if students would use the system if they had the resources they were surveyed on this item. The responses were almost equal with 29% on the affirmative and 26% on the negative. When asked if they would use the system applying the paper based system the result was far more favourable with 39% indicating positively and 17% indicating negatively (12% did not respond and 32% responded 'neutral'). This would suggest that it may be a viable system if a paper based system was trialled once more without the added complication of attempting the use of the mobile 'phone response mechanism.

As the literature suggests perceived usefulness (Davis, Bagozzi, & Warshaw, 1989) is a vital consideration for users when considering the adoption of new technology. In this study the 'usefulness' factor would have been strengthened by having students' results from having participated contribute to their overall subject mark. This however, appeared to lead into a quagmire of difficulties such as issues of equity in terms of cost constraints for students in purchasing appropriate technology and students' competence with using the technology without prior training.

***Observability***
Observability refers to being able to observe how to make the change. Over the weeks, students saw how other students were using the technology, but were also observing the lack of relative advantage of such an adoption. Moore and Benbasat (1989) argued that a relative advantage construct would assist in that adoption. Thus, if students had observed that using the mobile 'phone response system rather than paper based recording was an advantage they would have adopted it. What they observed in the lectures were students encountering difficulties using the technology, but the students who used the traditional paper-based method having an easier, less complex experience. The majority of students indicated that they did not use the

system because other students were not using it (51%). Thus, there was no perceived usefulness or ease of use (Davis, Bagozzi, & Warshaw, 1989) in adoption of ClickOn as it is currently structured which is important given the research undertaken by Brown, Massey Montoya-Weiss, and Burkman (2002). One student commented that 'There are only 6 or 7 people in my lecture who do it.'

***Complexity***

Especially considering the complexity attribute (Thompson, Higgins, & Howell, 1991), adoption of ClickOn was relatively complex, compared with the alternative. The process to participate was complex. The steps for students involved:

- pre-registration before the first lecture,
- receiving an official logon identifier via email,
- when in the lecture, logging onto the internet,
- navigating to the Wiley website,
- locating the voting function,
- reading the question,
- selecting the answer,
- navigating to the answer on the mobile phone,
- selecting this correct answer, and
- transmitting the answer via the mobile phone.

A willingness to participate in ClickOn would suggest an enhanced ability to administer the subject effectively. Given the complexity of opting in to (adopting) its usage, students who successfully navigated this process demonstrated more tenacity and innovativeness, consistent with Rogers (1962) original Diffusion of Adoption model. It was felt that if students believed there were intrinsic satisfactions (intellectual stimulation) and extrinsic reasons (good grades) (Packham, Jones, Miller, & Thomas, 2004) they would be more likely to overcome greater degrees of complexity in adoption. When asked if using the mobile system had any perceived usefulness in helping students learn more quickly the response (50%) was a clear indication that it did not or would not. Conversely when asked if the paper based system had any perceived usefulness by helping students learn there was almost a complete flip in responses with 47% agreeing but a small group of 10% disagreeing. This may not necessarily mean that the 10% of students prefer the mobile system but that they did not wish to use any such system.

There were similar responses in regard to understanding and remembering concepts presented in the lectures with 54% negatively disposed to using the mobile system and 17% negatively disposed to the paper system. Conversely, 11% were favourably disposed to the mobile system and 39% were favourably disposed to the paper based system. The most marked response came in regard to the issue of perceiving the system as a useful way to learn, with 46% negatively inclined regarding the mobile 'phone system.

When asked the same question in regard to using the paper based method 46% agreed that it was a useful way to learn (6% did not respond to the question and 33% were neutral). Following this same trend the majority indicated that the mobile system would not help their effectiveness as a student, nor would it increase their chances of getting higher marks, nor would other students perceive them as competent because of using it. These figures are indicated in table 3.

Table 3
Overcoming complexity *(all figures are shown as percentiles)*.

| Item | Did Not Respond | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| Would not help their effectiveness as a student | 10 | 0.0 | 3.3 | 32.2 | 36.7 | 17.8 |
| Would not increase their chances of getting higher marks | 7.8 | 0.0 | 5.6 | 33.3 | 34.4 | 18.9 |
| Would not help other students perceive them as competent | 8.9 | 0.0 | 7.8 | 40.0 | 31.1 | 12.2 |

Anecdotal information added further insight with students commenting that it was 'Too hard to use ClickOn', 'There were too many barriers to use ClickOn' and 'I changed my 'phone and SIM card, and now it won't work'.

***Compatibility and attitude***
Building on Bunker, Kautz and Nguyen's (2007) study, the compatibility attribute was arguably regarded by academics prior to the ClickOn introduction as the prime attribute. That is, adoption of an interactive mobile 'phone based technology would be very attractive (consistent with) to students' values and learning preferences, especially Gen Y students (Faust, Ginno, Laherty, & Manuel, 2001), thus they would be willing, if not eager to embrace it. This is counter to the results (with 44% negatively disposed, 14% positively disposed, 28% neutral and 14% did not respond), suggesting this attribute was sufficiently less important to Gen Y students than the complexity and relative advantage attributes.

This is possibly consistent with the work of attitude to adoption (Compeau & Higgins, 1995; Compeau, Higgins, & Huff, 1999) and planned behaviour (Icek Ajzen, 1991). Thus, whilst the Gen Y would have been receptive to the idea of technology adoption, in fact adopting it should proved intrinsic motivation (Davis, Bagozzi, & Warshaw, 1992), students experienced frustration in (or observed others) attempting to adopt it (Compeau & Higgins, 1995; Compeau, Higgins, & Huff, 1999). Contrary to the literature the respondents indicated a low favourability to the mobile 'phone based system across several question items as shown in table 4 – attitude toward using technology

Table 4
Attitude toward using technology *(all figures are indicated in percentiles)*.

| Item | Did not respond | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| Good idea | 13.3 | 2.2 | 17.8 | 31.1 | 23.3 | 12.2 |
| Like idea | 13.3 | 2.2 | 18.9 | 27.8 | 22.2 | 15.6 |
| Fun using | 13.3 | 1.1 | 8.9 | 33.3 | 27.8 | 15.6 |
| Process Pleasant | 13.3 | 2.2 | 17.8 | 31.1 | 22.2 | 13.3 |
| Like using | 13.3 | 1.1 | 14.4 | 30.0 | 27.8 | 13.3 |
| Look forward to using | 13.3 | 0.0 | 12.2 | 27.8 | 31.1 | 15.6 |
| Frustrating to use | 13.3 | 5.6 | 33.3 | 26.7 | 16.7 | 4.4 |

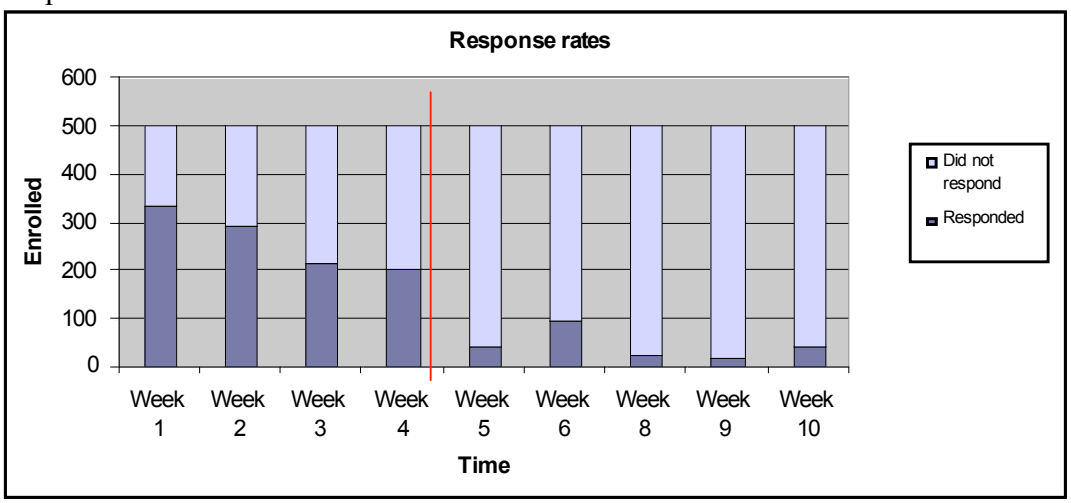
Qualitative data gathered supports this premise as indicated in the literature, as some students reported a desire to participate in on-line polling such as is used in the U-tube, Yahoo and similar websites and also in mobile 'phone based polling for

television programs such as "Australian Idol". Anecdotal information from students varied markedly with some indicating a strong desire to use the technology and others a distinct distaste for it. Favourable comments included; "I would prefer to do it online (at a computer, not on the 'phone)", "Awesome idea!", "I never got the registration confirmation email – I would love to have done it", and "It's bad technology, a good idea though". While several comments concerned the amount of time that was involved (actually no more on any occasion than 15 minutes aside from the initial explanation in week 1 which took 25 minutes), "Takes too long in the lecture", "It's disruptive to the end of the lecture", "Too disruptive" and "This is just like when WebCT was introduced, it's much better now".

**Class Participation and Attendance**

The results (see Graph 1) indicate that there was a marked downturn in attendance and/or participation after week 4 which continued throughout the semester until week 10 where there was a slight upsurge. Attendance figures were recorded electronically if students adopted the technology using their mobile telephones or manually if students 'adopted' the technology by responding to the questions presented via ClickOn using the paper based response system. Either way students were aware that attendance numbers were being measured and that their individual record of attendance was a contributing factor in the 'at risk' assessment. If students were designated as 'at risk' they would then be involved in a rather lengthy process of reporting to the Course Co-ordinator for a personal consultation and developing an academic plan to assist their future progress. The figures indicated have been adjusted to reflect the number of withdrawals from the subject or from the institution.

Graph 1
Response/Attendance rates




One of the underlying assumptions of this case study is that attendance is an important factor in students' final grades, their conceptual understanding of the curriculum and in their ability to administer their subject effectively. It has been well established in the literature that rate of attendance is a good indicator of performance.

The desire of the academic staff to provide relevant and interesting material and curricula for the students by introducing ClickOn as a tool to encourage engagement and knowledge retention is supported by the recent body of literature focusing on the

indigenous context and strategies to assist them (Bourke, Rigby, & Burden, 2000; McRae et al., 2000).

Based on knowledge of how to engage GenY subjects (Faust, Ginno, Laherty, & Manuel, 2001) the academic staff utilised the ClickOn process of interaction, hands-on, instant gratification, mobile 'phone technology. This was designed to provide a relevant context for learning and engage the students in a way they would find interesting, consistent with their non-educative experiences. The underlying premise, reinforced by the literature (McRae et al., 2000) that providing such a framework will encourage attendance cannot be supported by the experience in this case study. Students were given an appropriate, engaging framework, but attendance was largely unaffected, and participation rates in ClickOn were less than expected. Thus, attendance is multi-factorial, and causality is complex to unravel.

The social normative factors (Thompson, Higgins, & Howell, 1991) also had a significant contribution. Class data collected by an explicit method (in this case a 'show of hands') showed distinct trends with an underlying social factor (Thompson, Higgins, & Howell, 1991), for example in a class where a significant proportion of students expressed an interest in ClickOn, or the adoption of similar technology to aid learning, the majority followed. Likewise, attendance was influenced by social and normative factors. Anecdotally, students attended (or did not attend) lectures in social clusters. However, to gain a definitive insight, further research in this area is warranted, as it may be that social clusters are formed around attitude to attendance and learning, rather than the social group influencing individual attendance rate.

This uncertainty extends to the role of image in attendance tendency. It is not clear from the literature whether students decide to attend (or not) due to their perception of the congruence of that with their image, or through attending (or not) a self-image is constructed. Moore and Benbasat (1989) established that preference to adopt information technology was significantly impacted by image. Thus, the role of image should be considered in analysing this ClickOn case study as it applies to indicating whether there is a correlation between attendance and performance.

**Limitations**

This study was conducted at one institution over one semester and it was not compulsory for students to participate. Although this ensures the technology adoption models used to inform this study are fitting, based as most are on volitional behaviour rather than mandated adoption of new technology (B. W. Brown & Liedholm, 2002), it means that attendance is not necessarily an accurate reflection of participation in the use of the technology. There may have been students who chose not to participate at all and yet others who chose to participate vicariously via their fellow students.

The study was further hampered by the practical constraint of introducing the technology as part of the standard lecture period. This time is often crowded with administration updates and bulletins about study and employment opportunities let alone the demands of the curriculum. Into this two hour time slot students were expected to assimilate information and procedures about ClickOn.

At the trials prior to semester start all technology was fully operational and it was believed that the mixture of first, second and third year students in the lectures for this subject would be likely to adopt it and not find the required steps for adoption difficult.

A further limitation was that this innovation was introduced in the first semester of the year and the subject is a first year subject, thus most students had limited university-orientation, no previous experience of university-administered subjects, or their format or pre-requirements. This made it problematic to introduce the ClickOn concept to students and to enable their necessary pre-registration prior to running the first session. Although a trial period would have alleviated many issues the window of opportunity was limited to the particular semester in which it was used because of imminent changes in staffing.

## Conclusion

Despite the limitations of this case study, it has been useful research as a vehicle for insight into student adoption practices, particularly those in the Gen Y bracket. As the study has indicated, the students in this cohort were far more reticent to adopt new technology in their learning environment that one would suppose given the current literature and society's general expectation. This would lead one to realise that there are additional factors to consider when teaching and attempting to engage Gen Y students through the adoption of technology with its inherent factors of trialability, observability, complexity and compatibility. Student engagement is linked to attendance and vice versa. An engaged student is more likely to attend and a student once in attendance and engaged in the learning, is more likely to keep attending. It was an interesting finding that students were not so motivated through the provision of this bleeding edge technology. Further analysis is warranted regarding attendance and motivation, adoption of technology and its antecedents and a comparison of academic outcomes between three groups identified in this study; students who opted into ClickOn, students who used the paper recording method, and those who chose not to participate using either method.

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